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Extract of a Letter from Professor Hansen to the Astronomer Royal.

"*Gotha*, 1850, *June* 27.

"The work on the Lunar Tables is advancing daily, but we have not yet gone so far as to enable me to communicate to you any result. In respect, however, to the moon's motion since the more distant ages, I am able to inform you, that an assistant, to whom I committed last year the task of comparing the ancient eclipses with the tables of the present day, has found, from the nineteen eclipses of the Almagest, a motion of the moon's node, which agrees in a remarkable manner with that which you have deduced from the Greenwich Observations from 1750 to 1830. According to his statement, he has found the correction of Damoiseau's secular motion of the node to be

$$+1'\cdot643,$$

while your investigations have given

$$+1'\cdot721,$$

a most surprising agreement. These corrections also agree with my theory as nearly as can be desired. Thus the view which Professor Seiffarth, of Leipzig, has explained, according to which a very important correction of the motion of the moon's node is deduced from the ancient eclipses, appears to be incorrect."

At the meeting of May 10, the President gave an oral account of a new arrangement of the double-image micrometer. Referring to a paper in the *Memoirs* of the Society, in which the general structure of the four-glass eye-piece, with the second lens (reckoning from the object-glass) divided, is described, and in which the equations of achromaticity are investigated, he showed that three equations only are given between seven quantities (namely, the four focal lengths of the lenses and the three intervals between them), and, therefore, that any four of the quantities may be assumed. This circumstance permits an infinity of different forms of solution. One form, which appeared generally convenient, was indicated in the memoir, and it has been found in practice to be perfectly successful as regards the special object of the theory, and to be subject only to two small practical inconveniences; that the field of view is rather contracted, and that a rather rapid screw is required for the micrometer, by which one-half of the divided lens is made to slide past the other. The President then stated that he had received a communication from Mr. Valz, of Marseilles, in which that gentleman had pointed out to him that the equations might be satisfied in a form which would give a larger field of view, by using for the divided glass a *concave* lens; and the President stated that he had immediately perceived that the construction would possess these two further advantages,—that a slower screw would suffice, and that, in consequence of the thinness of the

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lens near the middle, very little light would be lost if the pencils of light were somewhat inclined to the axis of the telescope (the effect of the central thickness of a convex lens being that, if the pencils are at all inclined, a large proportion of the light is lost, more especially for the high magnifying powers.) The numbers which Mr. Valz pointed out are the following:—

Focal length of 1st lens, or that nearest the object-glass, arbitrary, or ...	a
Distance from 1st lens to 2d lens, the same as focal length of 1st lens, or	a
Focal length of 2d, or divided lens (which is concave)	1
Distance from 2d lens to 3d	1
Focal length of 3d, or field-glass	1
Distance from 3d to 4th	3
Focal length of 4th, or eye-glass	1

where the numbers 1 and 3 may be applied to any scale of linear measure whatever.

The next thing to be considered was the curvatures of the surfaces of the lenses. And here it is to be remarked that the accurate use of the double-image micrometer requires, both that the images be distinct, and that the images (considered as parts of the large image covering the whole field of view) be not distorted. The President had thought it probable that, for the higher powers, in which the pencils of light are very narrow, the first condition might be practically sacrificed to the second; but, upon trying surfaces which were better adapted to prevent distortion than to avoid indistinctness, the injurious effect on the definition was so striking, that he had determined to confine himself to the first condition. For securing this, the following rule is, in practice, sufficiently accurate:— Find, on one side of each lens, the place of intersection of the axes of pencils with the axis of the telescope; and on the other side, the place of intersection of the rays of light in a single pencil: if these are equidistant, the lens ought to be equiconvex: if the distances are unequal, the nearer of the two points ought to have the less convex surface. Applying this rule to the construction in question, the following are found to be proper forms:—

First lens, equiconvex.
Second, or divided lens, equiconcave (it is here nearly a matter of indifference).
Third, or field-glass, plano-convex, with its plane side next the divided lens.
Fourth, or eye-glass, equiconvex.

The eye-piece, constructed according to these rules, appears in practice to be excellent. Several change-lenses are provided for the first lens (their framing being so prepared that they necessarily take the proper distance from the divided lens), and in all the performance is extremely good. The images of stars are sensibly more round than those seen in the other constructions. There is no sensible distortion.

The eye-pieces, upon which the President's experiments have been made, were constructed from the numbers above given by Troughton and Simms.

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